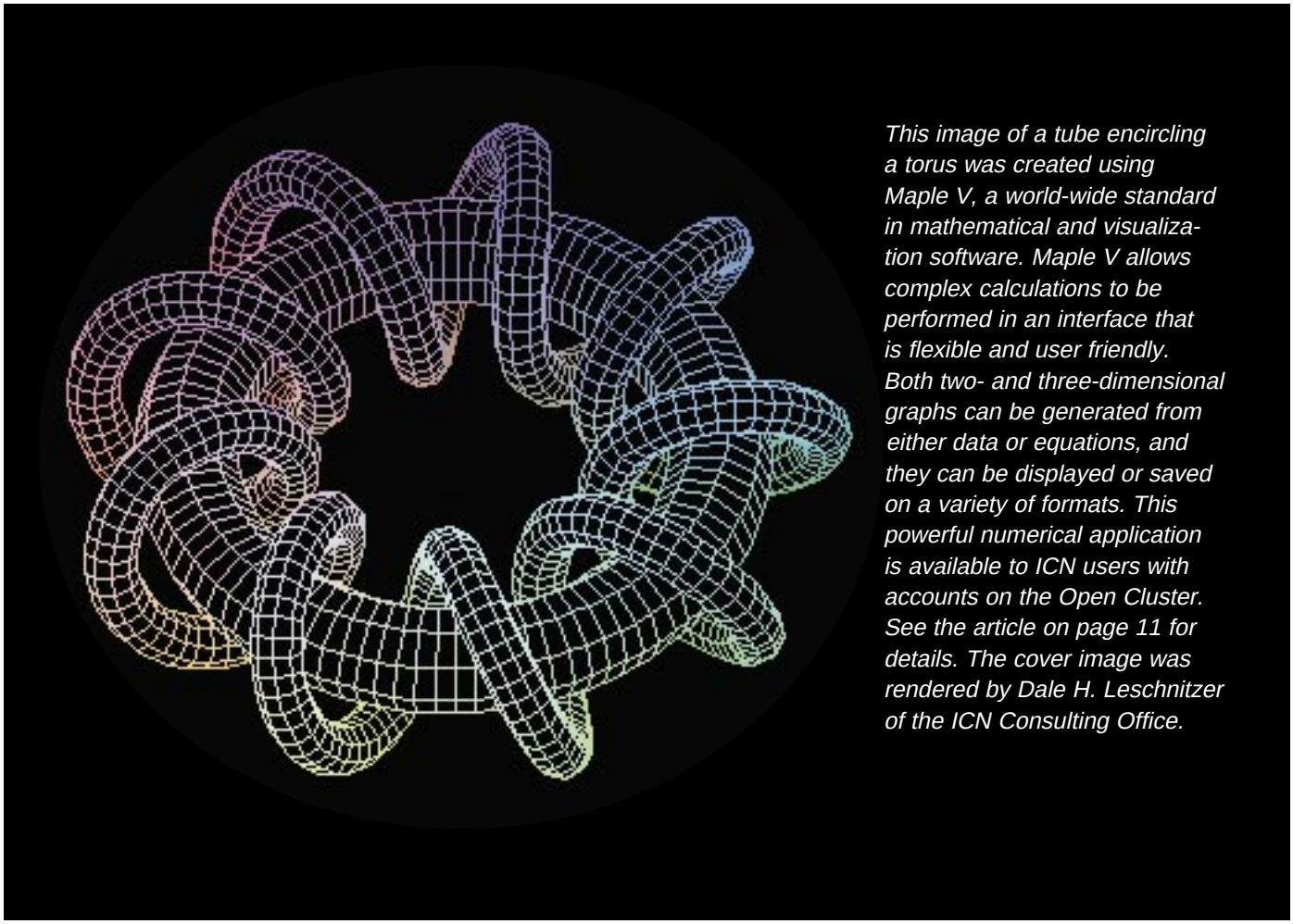
BITS computing&communications news

AUGUST 1996

COMPUTING, INFORMATION, AND COMMUNICATIONS (CIC) DIVISION • LOS ALAMOS NATIONAL LABORATORY



This image of a tube encircling a torus was created using Maple V, a world-wide standard in mathematical and visualization software. Maple V allows complex calculations to be performed in an interface that is flexible and user friendly. Both two- and three-dimensional graphs can be generated from either data or equations, and they can be displayed or saved on a variety of formats. This powerful numerical application is available to ICN users with accounts on the Open Cluster. See the article on page 11 for details. The cover image was rendered by Dale H. Leschnitzer of the ICN Consulting Office.

Inside this issue

CIC Customer Service Center . . . . . (505) 665-4444 or cichelp@lanl.gov

Integrated Computing Network (ICN)

Consulting:

Centralized scientific and engineering computing .....consult@lanl.gov or 7-5746

Lab-wide administrative and business systems.....labwide@lanl.gov or 7-9444

Passwords (required for access to ICN) .....validate@lanl.gov or 5-1805

Central Computing Facility (CCF).....7-4584

Advanced Computing Laboratory (ACL).....5-4530

Desktop Support Center (DSC).....7-4357 (7-HELP)

For PC questions: PC-help@lanl.gov or 7-9372

For Macintosh questions: Mac-help@lanl.gov or 5-1361

For UNIX questions: UNIX-help@lanl.gov or 5-2220

For groups with CIC-2 support contracts: 5-2220

Telephone Services Center.....7-3400

(includes voice mail)

Computer training

Lab-wide systems support training.....7-9444

Computer/workstation training.....7-9399

Personal computer training.....7-9071

Microcomputer support facility seminars.....7-4357

(Macintosh/IBM software, lending library)

List of Forms

Images on the Web: Some Tips

On the Web, when people initially call up one of our pages, they'll generally take only a few seconds to assess the page and determine whether they want to read further. They won't see it as we do—there'll be differences ranging from speed of connection to job priorities to personal preferences—but their assessment, quick and often final, is the one that determines the success of our materials.

In this context, graphics alone are rarely adequate to engage somebody's attention. Few people prowl the Web simply looking for well-designed pages. When used effectively, however, graphics can serve a variety of functions, including reinforcing a sense of professionalism, bringing content closer to the surface, establishing a sense of identity, and providing navigation options.

This article is not going to attempt to deal with the aesthetic aspects of graphics—there are plenty of other people who are far better qualified than I to address issues of that sort. There are, however, some technical aspects that also warrant attention and are too frequently overlooked or misunderstood. Those technical issues will be the focus here.

This article will be further restricted to deal only with in-line Web graphics. Other types of images (maps, etc.) that require the spawning of an external viewer will not be addressed at this time.

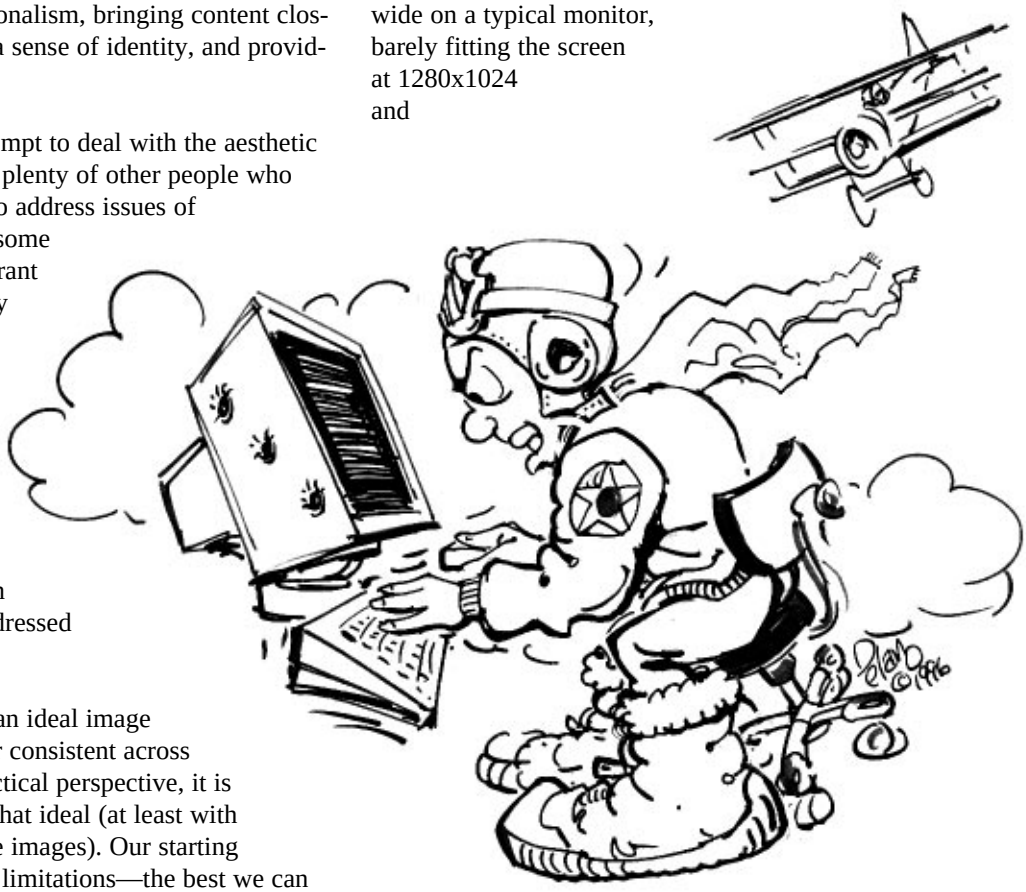
From a technical perspective, an ideal image would load quickly and appear consistent across various platforms. From a practical perspective, it is impossible to ever fully meet that ideal (at least with current technologies for in-line images). Our starting point, then, is an admission of limitations—the best we can make it is not as good as we'd like.

Once that starting point is accepted, though, there are a number of techniques we can use to make things "better," provided we first understand a bit about the underlying technologies.

Image Sizing

In the context of the Web, image size is measured in pixels (or cells), not inches or centimeters. Pixels are comparable to the "dots" used when measuring printer resolutions in "dots per inch" (dpi). An immediate difference between printers and computer monitors, though, is that monitors generally have much lower resolutions than printers, thereby yielding much lower quality graphics.

While typical printers offer 150 dpi to 600 dpi print quality, a 13" or 14" monitor offers roughly 50 pixels-per-inch at 640x480 resolution (VGA) or about 100 pixels-per-inch at 1280x1024. (Please remember these comparisons are approximate and will vary from monitor to monitor.) Hence, if we took a 4" wide image and exported it at 300 dpi (typical for a printer), we'd wind up with an image that displayed at roughly one- to two-feet wide on a typical monitor, barely fitting the screen at 1280x1024 and stretching well beyond it at lower resolutions. A good "rule of thumb," if we've sized an Adobe Illustrator or similar image in inches, is to export it at 75 dpi, since that corresponds very roughly to a "middle ground" 800x600 screen resolution on a typical monitor.



Another effect of images varying in size at various monitor resolutions is that a page layout that "looks good" at one resolution can look very different at another. An 800 pixel-wide

image, for example, would appear at a reasonable 8" at 1280x1064, but stretch to roughly 12" at 800x600 or 16" at 640x480 (again, based on a 13"-14" monitor).

If we want to ensure that the graphic will still fit fully on the screen at VGA resolution, then 600x400 pixels is about the maximum size you can work with (allowing some space for the browser itself). This really is an extreme case, though. Unless the graphic is the page, you'll rarely need anything near that size.

A better "rule of thumb" is to restrict image widths to no more than 475 pixels, which corresponds to the default display width of Netscape.

In any case, it is good to test the image at various screen resolutions to see for yourself how it will appear on various monitors.

Image WIDTH and HEIGHT

When a browser downloads a page with graphics, it is unable to lay things out completely until it knows the dimensions of all the graphics, which by default doesn't happen until all of the graphics have downloaded. Sometimes the effect is minimal, such as when the text appears first and then gets rearranged as the graphics come in. At other times, the effect is more pronounced, such as when a table contains graphics and the browser is unable to display any part of the table until it has the graphics and can calculate column and row sizes (not all browsers need to wait, but Netscape 2.0 for Windows, for example, does).

The WIDTH and HEIGHT attributes for the HTML <IMG> tag enable us to tell the browser in advance what the size of the image will be. Browsers that support these attributes (most modern ones do) can then lay out the page correctly from the start, leaving open the correct size empty spaces that the images can fill in as they arrive. Because this allows text to be displayed before all of the images have been downloaded, it makes the page readable more quickly, giving the impression of a faster page download (even though the actual time to download all of the text and graphics doesn't change).

WIDTH and HEIGHT are both measured in pixels (so they will still vary from one screen resolution to another). For example, the following tag would load a 200x100 pixel image:

<IMG WIDTH=200 HEIGHT=100 SRC="filename.gif">

One important detail: If you change the image file in any way, double-check to make sure the WIDTH and HEIGHT are still correct. If they aren't, the browser will distort the image to make it fit the specified size, which can lead to loss of legibility or worse.

Use the Correct Image Format

The two most widely supported formats for in-line Web images are GIF (Compuserve's Graphical Image Format) and JPEG/JFIF (ISO's Joint Photographers Expert Group/JPEG File Interchange Format). Each has its strengths and weaknesses, and each has its place in the Web.

GIF uses a palette of 2 colors (black & white), 16 colors, or 256 colors. It can only show the colors that are in its palette, but it is very useful for line art, lettering, or other images with sharp, distinct lines and/or a limited number of colors.

GIF 89a supports "Transparency," which allows a page background to show through the background of the image, giving the impression that the image is not bordered by a simple rectangle (though in reality it is). Transparency is a widely used, widely supported, and useful feature.

GIF 89a also supports "interlacing," which allows the general shape of the image to appear fuzzy at first, after only a portion of it has been downloaded, and to then resolve itself into greater clarity as the rest of the image arrives. Interlacing is also widely used, but it is the subject of some debate because (a) it makes files somewhat larger, and (b) certain browsers do not always fully resolve the image (most notably Netscape 1.x for Windows).

Because of some proprietary issues involving the LZW compression algorithm that GIF uses, it is likely that GIF will be superseded by PNG (Portable Network Graphics) within the next few years. At the time of this writing, though, PNG is still a W3C Working Draft with only limited support in the market.

JPEG is actually a compression algorithm instead of a file format; JFIF is the file format that wraps around JPEG. In common usage, however, "JPEG" is used to refer to both.

JPEG/JFIF is a 16-million color format based on a "lossy" compression algorithm that takes advantage of limitations of the human eye to achieve greater compression. It is very well suited to photographs, realistic scenes, or other images with subtle changes in tone. Its compression can be adjusted, so that less compression can be used when higher quality is needed, but more compression can be used when quality isn't as important (thereby yielding smaller file sizes and faster transfer times).

The downside of JPEG/JFIF is that it is not good for the types of images that GIF is. Sharp lines, lettering, etc., have a tendency to get blurred under JPEG/JFIF.

Macintosh users should note that the JPEG/TIFF format widely available on Macs is not widely supported across platforms. Instead, it is important to use the JPEG/JFIF format.

GIF is good for what JPEG/JFIF isn't good for and frequently yields smaller file sizes for those images. Similarly, JPEG/JFIF is good where GIF is weak and frequently yields smaller file sizes in those cases. Be familiar with both, test each when in doubt, and use each to its strength.

Use the Correct Palette

The "palette" is the selection of colors available for a 2-, 16-, or 256-color GIF image. Palettes are not used by JPEG/JFIF or other truecolor/16-million color formats. (Note, however, that a 16- or 256-color monitor will map truecolor images to the monitor's internal palette when displaying them.)

Ideally, the palette used in the image should match the palette used by the computer monitor. This is easy if the computer monitor is set to 16-bit or higher color (32,000 colors or higher). Unfortunately, though, many users still have 16- or 256-color monitors, and among those monitors there can be a great deal of variation.

Macintosh, Windows, and UNIX workstations all use slightly different palettes. This is further complicated by the fact that certain browsers (Netscape in particular) don't always make use of the complete palette that's available to the monitor.

When the browser loads an image whose palette is different from the palette available to the browser, then the browser will either change an unavailable color to the nearest available color or "dither" two nearby colors to achieve an approximation of the unavailable color.

Dithering is mixing of colors which is achieved by putting the different colors in adjacent pixels. For example, the following illustrations show black and white being dithered to yield gray, in both a real-size (see Figure 1) and enlarged view (see Figure 2).

The image in Figure 1 appears gray, but the underlying fuzziness of the dithering becomes clearer when we try to print some text on top of it (see Figure 3).

This same type of effect can occur when we use colors that do not match the palette available to the browser.

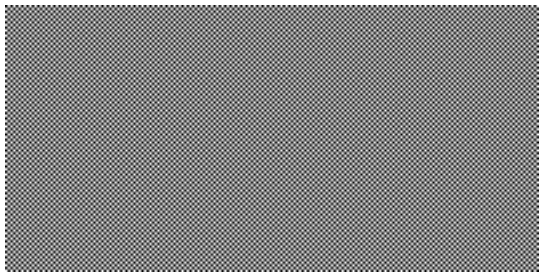


Figure 1: Real-Size View of Dithered Gray

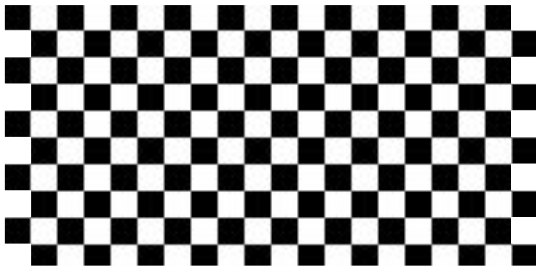


Figure 2: Enlarged View of Dithered Gray

Figure 3: Text on Dithered Gray

While it is impossible to accommodate all browsers on all platforms (unless we give up on color entirely and do everything in black and white), a good starting point is the Netscape palette for 256-color Windows monitors. Netscape uses a 216-color subset of the 256-color Windows palette. This becomes especially significant if we're working with grays because only four grays are available (if we don't count black or white). (This shortage of grays is the source of the dithering/fuzziness many of us have encountered when trying to build GIF-based buttons.)

The 216-color Netscape Windows palette is available from various sources, including the IA Internet/WWW Subject Area Web page at (access restricted to government machines)

http://www.lanl.gov/projects/ia-lanl/areas/int-web/

If you are building a new GIF, you can load the palette before you begin your work. If you have already constructed a GIF with a different format, you can convert to the 216-color palette as follows:

- select Colors/Load Palette in PaintShop Pro (Windows) or Mode/Color Table/Load in PhotoShop (Macintosh),
- select the palette file,
- select the Nearest Color option for applying the palette (only required for existing images), and click OK.

The procedure will vary from application to application, but the overall effect will be the same: colors will be adjusted in the image so that what you view as you construct the image will be closer to what the browsers display on users' monitors. It won't be perfect (as discussed further below), but it will at least be more consistent than the standard 256-color palette that comes with Windows or Macintosh or UNIX.

Select Colors with Care

A number of us have encountered the problem where colors that look good under UNIX or Windows become very different when viewed on a Macintosh. This is partly due to the differences in palettes discussed above, but it's also due to differences in the software that drives the monitors themselves. In an oversimplified nutshell, what happens is this:

- Black is black and white is white on any correctly adjusted monitor, regardless of platform.
- Under standard defaults, dark colors appear lighter on Macintoshes than on Windows or UNIX machines.
- The human eye is more sensitive to differences in hue as colors become lighter.
- Subtle differences in hue for dark colors are more pronounced on Macintoshes than on Windows or UNIX machines.

In other words, what looks like a dark blue under Windows can appear as a paler turquoise or purple on a Macintosh.

In more specific terms, when a computer monitor displays increasingly light colors, moving from black to white, the increase does not occur in a straight line. On a grayscale, if black is 0 and white is 255, then 1 is not 1/256th as light as white, 127 is not half as light as white, etc. On a standard unadjusted monitor, the darker colors are darker than they would be if the rate of increase were linear. Gamma is a measure of this non-linearity, which exists independent of the contrast or brightness settings for the monitor.

The compounding factor here is that the human eye is more sensitive to differences in hue as colors become lighter. A 3:1 blue:red ratio is clearly more purple than a 3:0 ratio if the colors are light enough, but as the colors become darker it becomes more difficult to discern the red component in the 3:1 mix.

The Macintosh OS adds in a gamma adjustment that the other operating systems do not have, which causes darker colors to become a bit lighter. (For many monitors, Mac users can adjust this correction in the monitors control panel; if gamma adjustments are not available on the main monitors control panel, then hold the option key while selecting the options button.)

An effect of dark colors being lighter on a Macintosh is that the differences in color become more evident. On UNIX or Windows, the Red:Green:Blue colors of 51:0:153, 0:0:153, and 0:51:153 will all appear to be very near a deep blue. On a Mac with default gamma adjustment, those same colors, lighter, will clearly be purple, blue, and turquoise.

Hence, if you work under UNIX or Windows and want a blue to remain blue across platforms, watch out for the red and green components. (The same applies for red and green.) Conversely, if you work under Macintosh, understand that subtle distinctions in darker colors will be lost when the image is viewed under UNIX or Windows (e.g., don't rely on subtle differences in darker colors for anything important).

Note that this section applies to both palette GIF and truecolor JPEG/JFIF images (unlike the palette discussion in the previous section).

Additional Information

As of the time of this writing, the IA project is developing a white paper on image formats that will address some of the issues in this article and that will also extend to other issues such as non-Web image formats, compression algorithms, printing considerations, etc. We anticipate publishing this white paper as a request for comment (RFC) for Laboratory-wide input sometime during August.

For updates on the status of the white paper and information about other areas being addressed by the IA project, please watch the IA home page at http://www.lanl.gov/projects/ia/ or look under "What's New" from the Laboratory home page. If you would like printed or e-mail copies of any of the IA materials, please contact Tad Lane at the address given below.

Tad Lane, tad@lanl.gov, (505) 667-0886
Information Architecture Standards Editor
Communications Arts and Services (CIC-1)

CIC-4 Awards External Paging Contract and Expands Local Paging Capabilities

External Paging Services by PageMart

The Telecommunications Group (CIC-4) recently awarded the LANL contract for external radio paging services to PageMart. These services were previously provided by Westlink and Skytel. All Westlink and Skytel pagers will be replaced by PageMart pagers during the cutover month of August 1996. This change does not affect Laboratory pagers; that is, pagers that have numbers beginning with 104 or 118.

The PageMart contract is designed to fulfill all paging requirements not covered by the local paging services provided by LANL. Although the new contract requires customers to change their pager numbers, it also provides several benefits. For example, combining all the leased Laboratory pagers into one competitively bid contract should save LANL over $11,000 per month (more than $400,000 over the three year contract), which translates into significant monthly savings for each customer.

PageMart has two nationwide 900 megahertz frequencies and a sophisticated computer controlled digital satellite system. This allows PageMart customers to use the same pager anywhere in the country, including the local area in and around Los Alamos. Another benefit is the option to select specific paging areas instead of paying for nationwide service. For example, a pager with Los Alamos area service could be activated for the San Francisco bay area for a week of travel to that area. Customers do not have to pay for nationwide service unless they really needed it. Additionally, there will be no unwieldy PIN numbers to remember for nationwide paging. Paging offered on the external contract is primarily numeric, with alphanumeric paging available for an additional cost.

Local Paging Services by LANL

LANL's local paging system has transmitters at Pajarito Mountain, at TA-55, and at two new locations: TA-57 (Fenton Hill Site in the Jemez Mountains) and Kirtland Air Force Base in Albuquerque. This new system offers full alphanumeric, numeric, and voice paging, with good coverage between Los Alamos and Albuquerque. To access the LANL paging system from Albuquerque, call 764-1870. This number is remote call forwarded to 665-9800, the off-site paging access number. Conversely, you can also receive pages from Los Alamos while you're in Albuquerque. Customers previously using US West for alphanumeric paging services between Los Alamos and Albuquerque can now use LANL's alphanumeric local paging system at a considerable savings. Finally, you can now send alphanumeric pages via the Web. From the LANL Home Page, simply go to the Phone Book, and then click on the Alphanumeric Paging Interface.

Eric Powers, ep@lanl.gov, (505) 665-3461
Telecommunications Group (CIC-4)

FTS 2000 Provides Savings for LANL Telephone Services

This past year the Telecommunications Group (CIC-4) entered into an agreement with AT&T to lower LANL's per-minute rate for on- and off-site calls. As a LANL employee, you can take advantage of these lower rates by using the Federal Telecommunications System (FTS) 2000. Using FTS 2000 for on-site calls is automatic. Anytime you pick up the receiver of a LANL telephone you're using FTS 2000. Using FTS 2000 for off-site calls, however, is a little more complicated.

Using FTS 2000 for Off-Site Calls

To use FTS 2000 for off-site calls you must obtain and use a LANL corporate calling card. Here's how it works. Suppose you're in a hotel in San Francisco and you need to make a long distance call. At this point you have two options:

Option 1: Dial 1-800-CALL-ATT (just like the commercial says) and follow the prompts. You will be asked to enter the number you want to reach and your corporate calling card number. (See the example below and note that the Z's represent the number you want to reach and the X's represent your corporate calling card number.) This method should always work.

1-800-CALL-ATT-1-ZZZZZZZZZZ-XXXXXXXXXX

Option 2: Enter 10288-0, the number you're calling, and your corporate calling card number (see example below). This option seems easier but sometimes it isn't. The 10288 code doesn't always work because long distance carriers vary from place to place. If you happen to be in an area that has a carrier other than AT&T, and that carrier has blocked access to ATT, 10288 will not work and you will have to use 1-800-CALL-ATT.

10288-0-ZZZZZZZZZZ-XXXXXXXXXX

A good way to know if you're using the right long distance service is to listen to the recorded message. If it says "Thank you for using AT&T," you're onboard; if it says "Thank you for using [some other carrier]," you missed the boat.

Using FTS 2000 for Dial-Up Access

Many dial-up users will want to access LANL computers through the TIG (terminal Internet gateway) by dialing 1-800-443-1461. This option works fine because you don't have to worry about which telephone company you're using and the cost is equal to the FTS 2000 rate.

Even if you don't use the TIG (e.g., your computer only has dial-up access without Internet access) you can still get the FTS 2000 rate by using your LANL corporate calling card and accessing AT&T's long distance service. This option costs less than dialing direct or using a calling card from a carrier other than AT&T. Here's how it works. Suppose you have an external Micro Port modem at home, and you want to access a computer at LANL. You would enter the following:

atdt102880,,ZZZZZZZZZZ,,XXXXXXXXXX

In this example, the commas represent pauses in the dialing pattern. It is important to know that external modems have maximum allowable characters. This means that you may need to adjust the value of each comma to stay within the allowable number of characters. Because the Micro Port only accepts 39 characters, pauses should be defined as six seconds each, as shown above. If the pauses were defined as one second each, the maximum allowable characters would be exceeded.

Each modem has different requirements, so please check with the folks at the Network Operations Center (667-7423) if you need help configuring your particular modem. They will be happy to assist you.

If you have additional questions regarding FTS 2000 capabilities, contact any of the following people:

- Judi Broste (667-0705 or jab@lanl.gov),
- Kay Cordova (667-7882 or kcordova@lanl.gov),
- Roger Crandell (667-7860 or rwc@lanl.gov), or
- Karl Pommer (665-1641 or kxp@lanl.gov).

Judi Broste, jab@lanl.gov, (505) 667-0705
Telecommunications Group (CIC-4)

Portland Group HPF Compiler Available on Workstations

The Portland Group High Performance Fortran (PGHPF) compiling system, designated pghpf, has been installed on the LANL open software server caja and on the LANL secure HP cluster. In the open, the compiler is available for Hewlett-Packard, IBM RS/6000, SGI, and SPARC systems running SunOS 4.1.x or Solaris 2.x.

High Performance Fortran (HPF) is essentially a superset of Fortran 90. It contains a number of compiler directives and a few language extensions in support of the data parallel programming model. Codes written in HPF can run in parallel on a collection of workstations. One advantage of HPF over some other methods of parallel programming is that the necessary communication is completely hidden from the user.

To use the PGHPF compiler on your workstation, your system administrator must mount caja:/disks/pgi. Once this is accomplished, you must

- Add /dir/machine/bin to your path variable, where dir is the directory under which the software is mounted on your machine, and machine is either hp, rs6000, sparc, solaris or sgi;

- Set the PGI environment variable to /PGI;

- Set the LM_LICENSE_FILE environment variable to $PGI/license.dat; and

- Add $PGI/man to your MANPATH environment variable.

We suggest using hpf as the suffix on your HPF program files.

To access PGHPF Web information, open the file /pgi/doc/hpf/html for access to the FAQ, man pages, reference manuals, and other Web type information, or open file /pgi/doc/hpf/html/pghpf.index.html to access just the Web documents. For those seeking more information on HPF, there are a number of Web sites that we can recommend. For general information about HPF and related topics such as Fortran D, Fortran 90D, and Vienna Fortran, check out the following URL:

http://www.crpc.rice.edu/HPFF/home.html

Chuck Koebel of Rice University, who has been a member of the High Performance Fortran Forum from its inception (which is the committee responsible for HPF), has an excellent Web tutorial on HPF. The URL is

http://www.cs.rice.edu/~chk/hpf-tutorial.html

The University of Liverpool has also put together several nice Web tutorials on HPF. Especially noteworthy are the "From Fortran 77 to HPF" seminar, the "HPF for Fortran 90 Programmers" three-day course, and the "HPF for Programmers" five-day course. The URL to access all of these is

http://www.liv.ac.uk/HPC/HPFpage.html

Since HPF is based upon Fortran 90, you might be interested in Michel Olagnon's F90 FAN (Fortran 90 Frequently Asked about News). This document can be accessed at either

http://www.ifremer.fr/ditigo/molagnon/fortran90/engfaq.html

or

http://lenti.med.umn.edu/~mwd/f90-faq.html

The High Performance Handbook by Koebel and others contains an extensive discussion of the language, and it has many examples. This book was published in 1994 by MIT Press. The ISBN for hardback is 0-262-11185-3 and 0-262-61094-9 is the ISBN for the paperback.

Currently, we only have an evaluation copy of the PGHPF compiling system on the Advanced Computing Laboratory's Cray T3D; however, we are working on obtaining a licensed copy for the Cray PVP's and T3D's. We will make an announcement as soon as it becomes available.

Finally, I have put together a short talk on HPF, which can last from twenty minutes to an hour, depending on your wishes. Please call me and I'll be happy to present it to your organization.

Bob Boland, wrb@lanl.gov, (505) 667-1729
Distributed Computing Group (CIC-8)

Research Library's Monthly Electronic Newsletter

The Research Library (CIC-14) publishes a monthly electronic newsletter as one way to let its customers know about products, services, and significant developments. While most of the products and services announced are new, we sometimes publicize existing products and services because some of our customers may not be aware that they're available. The newsletter is usually available on the first working day of each month.

There are two ways to read the Newsletter.

(1) The newsletter is available from the Research Library's Web site (http://lib-www.lanl.gov) under News and Information. (The direct URL is http://lib-www.lanl.gov/libinfo/news/news.htm). The advantages of reading the newsletter on the Web are three-fold: (a) it is hyperlinked to the products and services discussed, so you can check them out immediately, (b) direct e-mail windows are provided to communicate to the author or point of contact, and (c) past issues are archived, so if you forgot something or missed an issue you can always go back to it. The downside is that you have to remember to go to the Web address each month to read the newsletter.

(2) You can also subscribe to the Newsletter via the Library's Listserv. The advantage here is that the Newsletter is automatically sent to your e-mail box every month—you don't have to remember to go get it. The disadvantage is that it is in plain text, so you do not have hot links and e-mail links. And if you delete it, it's gone. To initiate an e-mail subscription, send an e-mail message after completing it as follows: (a) enter ListManager@lanl.gov in the "To:" line of an e-mail message, (b) leave the "Subject:" line blank, (c) enter the following message (exactly as shown) in the body of the message:

```
subscribe lib-news
end
```

Perhaps the ideal method is to get the Newsletter via the Listserv so you're reminded when it comes out, and then look at the current and past issues on the Web so you can immediately link to whatever interests you.

Ken Collins, kac@lanl.gov, (505) 667-4446
Research Library (CIC-14)

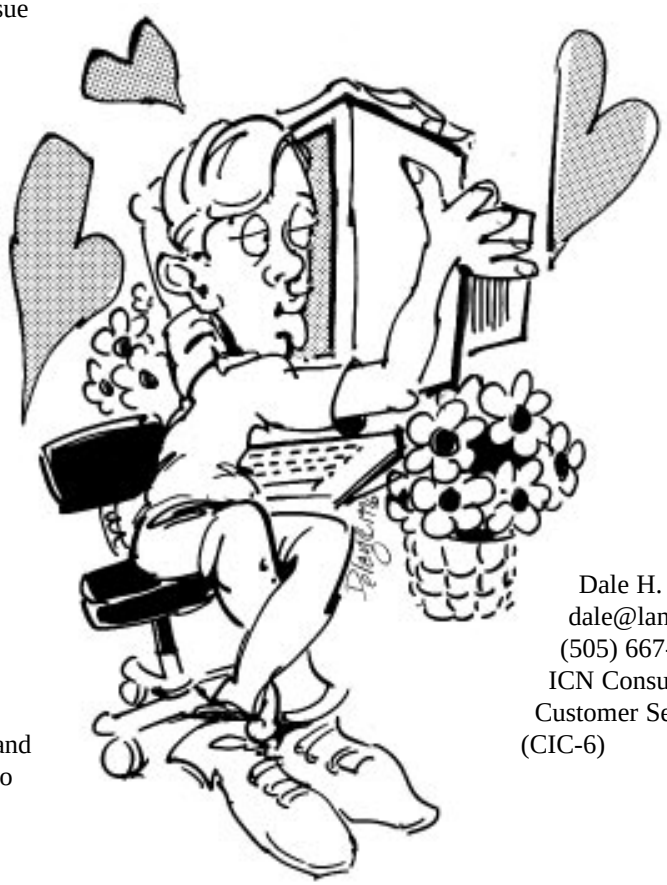
Cluster Tutorials on the Web

The Cluster Team would like to announce the release of two new tutorials on the Web. The first tutorial is on the Load Sharing Facility (LSF). This suite of utilities helps balance the computing load on both the Open and Secure Clusters. LSF is easy to use and can cut down on the wall-clock time of jobs. In addition, LSF has several other nice features including tc-shell (tcsh), batch job capabilities, and easy submittal of PVM jobs. If you want to learn how to speed up response time on the Clusters, point your browser at the following URL (see Figure on page 9):

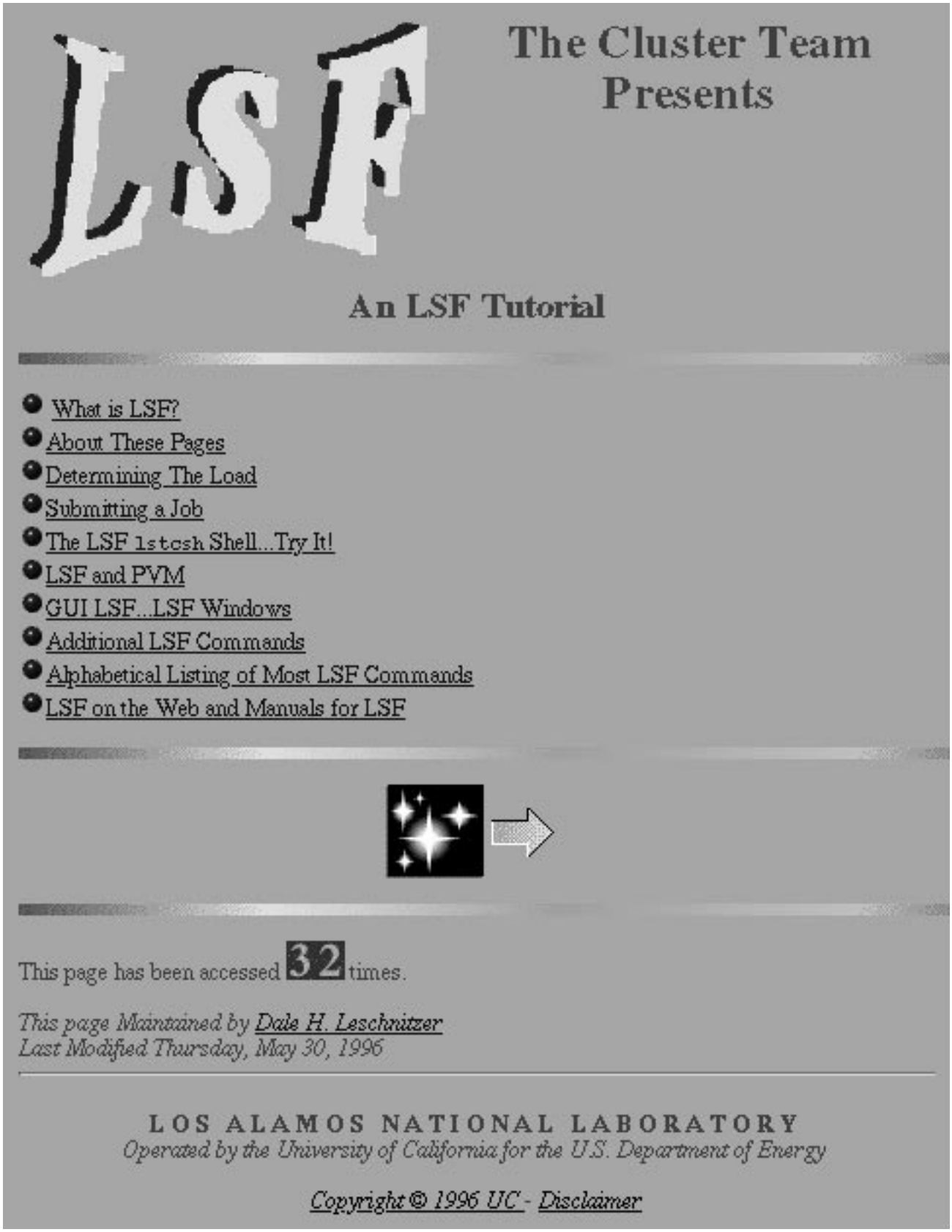
http://saaz.lanl.gov/lsf.html

The second is a tutorial on the mathematical package called Maple V. This tutorial covers most aspects of Maple including numerical calculations, graphics, and statistics. If you are interested in using Maple but are not sure how to get started, this tutorial is for you. You can find the Maple tutorial at the following URL (see Figure on page 10):

http://saaz.lanl.gov/maple.html



Dale H. Leschnitzer
dale@lanl.gov
(505) 667-5746
ICN Consulting Office
Customer Service Group
(CIC-6)


LSF
The Cluster Team Presents
An LSF Tutorial
What is LSF?
About These Pages
Determining The Load
Submitting a Job
The LSF 1stcsh Shell...Try It!
LSF and PVM
GUI LSF...LSF Windows
Additional LSF Commands
Alphabetical Listing of Most LSF Commands
LSF on the Web and Manuals for LSF
This page has been accessed 32 times.
This page Maintained by Dale H. Leschnitzer
Last Modified Thursday, May 30, 1996
LOS ALAMOS NATIONAL LABORATORY
Operated by the University of California for the U.S. Department of Energy
Copyright © 1996 UC - Disclaimer

The Cluster Team Presents

A Maple Tutorial

- What is Maple?
- About these pages
- Maple: The basics
- Numerical Calculations
- Graphics: 2-D and 3-D plots
- Algebraic Calculations
- Calculus
- Differential Equations
- Matrix Operations and Linear Algebra
- Special Mathematical Functions
- Statistics
- Programming
- Maple on the Web and Books on Maple

This page has been accessed  times.

This page Maintained by Dale H. Leschnitzer
Last Modified Friday, May 17, 1996

LOS ALAMOS NATIONAL LABORATORY
Operated by the University of California for the U.S. Department of Energy

Maple on the Cluster

The Cluster Team supports two major mathematical packages on the Open Cluster: Mathematica and Maple. Mathematica was discussed in an earlier BITS article ("Mathematica on the Cluster," August 1995, pages 12-14). Here we give an introduction to Maple.

What is Maple?

Maple V (Release 4), commonly called Maple, is a powerful mathematical problem-solving and visualization system used world-wide in education, research, and industry. Maple's principal strength is its symbolic problem solving algorithms. Unlike conventional math software that works with integer and floating-point numbers, Maple can solve problems involving formal mathematical definitions and then return results as mathematical objects in either symbolic or arithmetic format. Derived from over a decade of world-class R&D and customer service experience, Maple provides all the right tools for users in education, research, and industry. Maple is a product of the Waterloo Maple Software Corporation. Getting started with Maple is easy, and it can rapidly become a freehanded mathematical sketch pad for the user.

Maple supports a plethora of mathematical systems and procedures including:

- Numerical calculations;
- Calculus, including ordinary differential equations;
- Equation solving and function manipulation;
- Trigonometric, exponential, logarithm, and other special functions;
- Linear algebra, including the solution of linear systems and eigenanalysis;
- Statistics;
- 2-D and 3-D plotting;
- Animation; and
- Interface with C and Fortran programs.

How to use Maple

There are two main versions of the Maple interface. The first is a text-based interface, and the second is an X-windows application. They can be found on the Open Cluster at /usr/bin/maple (Maple text-based executable) and /usr/bin/xmaple (Maple X-windows executable).

The graphics shown in this article were all generated from the X-window interface.

Maple allows you to organize your session onto pages called worksheets. These worksheets can be saved or formatted for import into other documents. Most calculations are entered into Maple in the same way one would use a calculator. Maple allows you to store and utilize variables, constants, functions, etc.

Numerical Computation

Maple displays your calculations in a true WYSIWYG (What You See Is What You Get) format. If you ask it for a summation, it will display the summation for you. Furthermore, Maple does not evaluate symbolic expressions until you ask it to. This helps prevent round-off errors and misinterpretation of numerical data. A typical Maple worksheet is shown in Figure 1.

```
> Sum ((2*i+5)/(3*i^2-5),i=1..10);
```

$$\sum_{i=1}^{10} \frac{2i+5}{3i^2-5}$$

```
> value(");
```

$$\frac{-29392799449}{48571966058}$$

```
> evalf(");
```

$$-.6051391746$$

Figure 1. Typical Maple Worksheet

In addition to algebraic computations, Maple also allows you to utilize calculus and differential equations as shown in Figure 2.

```
>
> sample_DE:=X^2 * diff(y(x),x) + y(x)=exp(x);
```

$$sample\_DE := X^2 \left(\frac{\partial}{\partial x} y(x)\right) + y(x) = e^x$$

```
> dsolve( sample_DE, y(x));
```

$$y(x) = \frac{e^x + e^{\left(-\frac{x}{X^2}\right)} \_C1 + e^{\left(-\frac{x}{X^2}\right)} \_C1\, X^2}{1 + X^2}$$

```
>
```

Figure 2. Display of Differential Equation

Graphics with Maple

You can generate both 2-D and 3-D graphics with Maple. These images can be generated either from your own data or from equations you import. Multiple curves can be graphed on the same plot. Figures 3 and 4 are examples of plots generated with Maple.

To assist you with the use of Maple on the Open Cluster, the Cluster Team has put together a Web-based tutorial. We encourage you to point your Web browser at

http://saaz.lanl.gov/maple.html

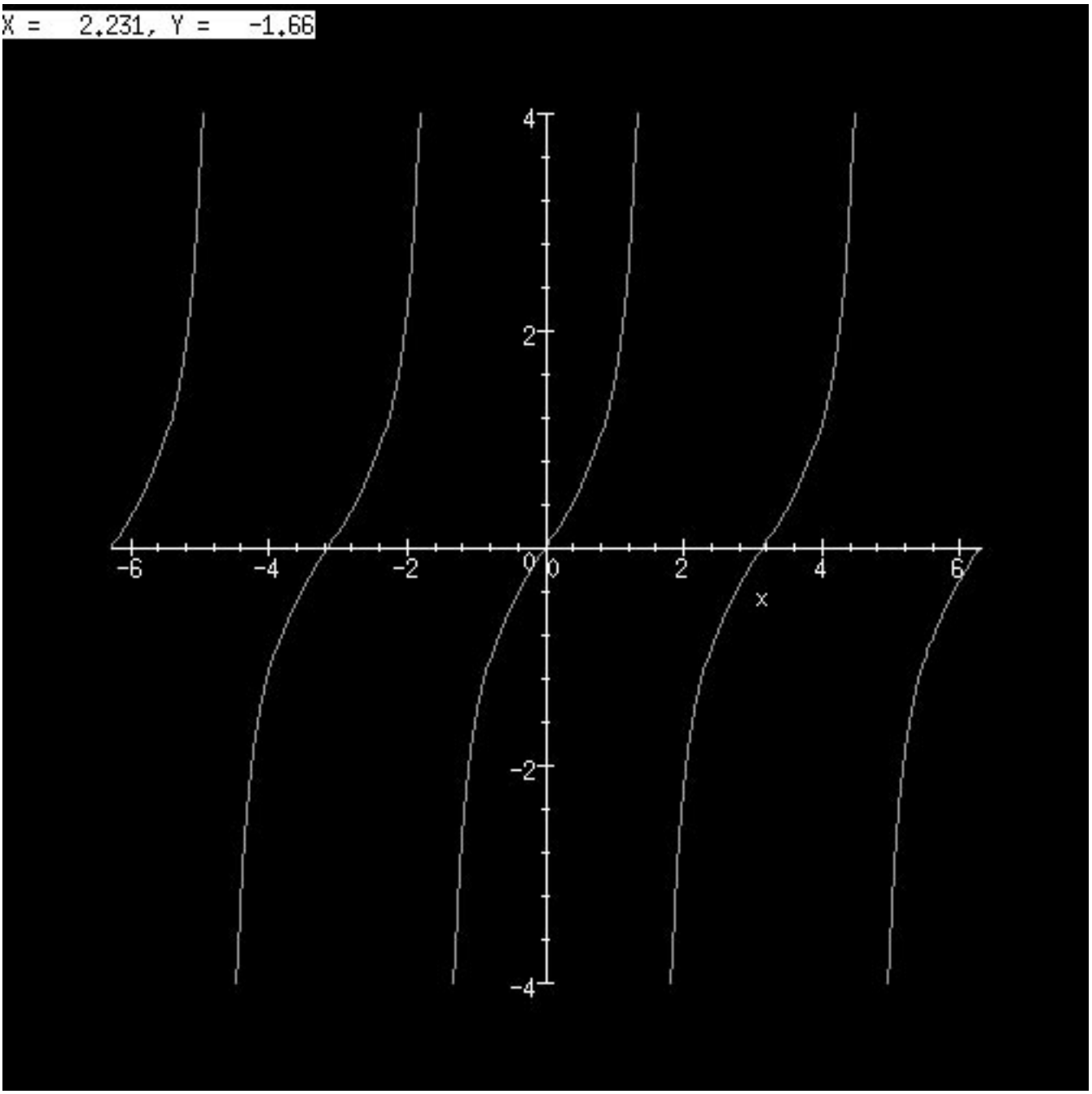


Figure 3. Maple 2-D Plot

We also encourage you to visit the Waterloo Maplesoft Web pages at

http://www.maplesoft.com

Dale H. Leschnitzer, dale@lanl.gov, (505) 665-5868
ICN Consulting Office
Customer Service Group (CIC-6)

W. Robert Boland, wrb@lanl.gov, (505) 667-1729
Distributed Computing Group (CIC-8)

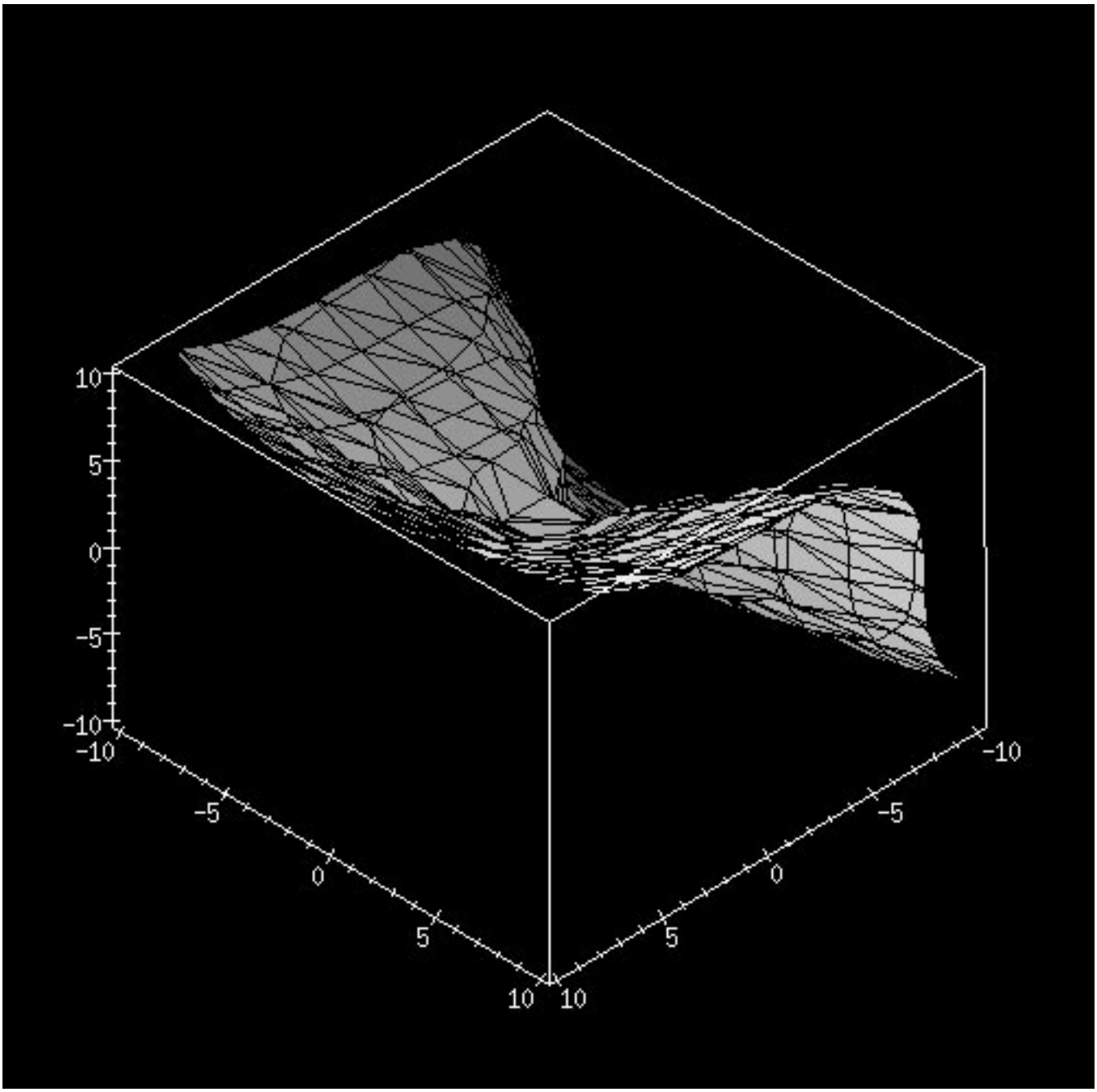


Figure 4. Maple 3-D Plot

Vendor Computer Training

The Customer Service Group (CIC-6) supports vendor training in technical computing areas such as programming languages, system administration, networking, and World Wide Web development tools. The support provided by CIC-6 can be as limited as providing the appropriate facilities for a specific group or as extensive as coordinating training functions such as system administration, vendor acquisition, EDS administration, and class facilitation. The table below lists classes that are either currently being offered or are available on request. An expanded list of classes that are potentially available can be viewed on the Internet at

http://www.lanl.gov:8010/computer-information/ComputerTraining/Vendor.html

To request registration in any vendor course or for general assistance with vendor training, please contact the CIC-Division Vendor Training Coordinator at (505) 667-9399 or send e-mail to cic6-train@lanl.gov.

*Cost per student will vary depending on the total number of students enrolled in the class.

Course Title	Date	Time	Cost	Course Number
C Programming (Beginning)	**8/26–30/96**	**8:30–5:00**	**$1200–$1700***	**3996**
	Prerequisite(s): An understanding of and useful skills in a high-level programming language. A current ICN password is required. Topics Include: Introduction and Fundamentals; Basic Semantic Constructs - Getting; Base Level I/O With C; The Preprocess-Compilation Environment; Operators, Data Types, and Storage Classes; Control Flow Constructs; Conditional Constructs; Higher-Level Data Constructs in C; File I/O; UNIX Software Tools and POSIX System Calls.			
C Programming (Advanced)	**September**	**8:30–5:00**	**$1200–$1700***	**4777**
	Prerequisite(s): Useful skills and experience with the C Programming. A current ICN password is required. Topics Include: Data Structures, Algorithms, and OOP; An Advanced Clinic for C ; The ANSI C Recommendation X3.159; C and ANSI C War Stories; The Data Structure and the Assessment of Algorithms; Arrays; Structures; Unions; Stacks; Queues; Linked Lists; Recursive Functions; Binary Trees; Hashing; File Organizations Using the C Runtime Library; Standard Interprocess Communication Mechanisms; and An Introduction and Overview of AT&T's C++ 3.0.			
C++ for Experienced Programmers	**Available on Request (5 days)**		**$1200–$1700***	**9050**
	Prerequisite(s): Excellent C Language programming skills. Topics Include: Major Differences and Additions to ANSI C; Building C++ Classes; Introduction to Text I/O with C++; Function Overloading; Single Inheritance; Virtual Functions; Multiple Inheritance; Operator Overloading; Creating, Initializing and Assigning Objects; Passing and Returning Objects; Templates, Parameterized Functions and Classes; C++Stream I/O with the File System; and C++ Course Summary.			

Course Title	Date	Time	Cost	Course Number
Perl Programming	**Available on Request (1–3 days)**		**$500–$700/day***	**8095/8093**
	Topics Include: Describes the programming language that occupies the niche between shell and C Programming; syntax and semantics; data types; operators, control flow, regular expressions, and I/O facilities; the Perl debugger.			
Perl Programming for the WWW	**Available on Request (2–3 days)**		**$500–$700/day***	
	Prerequisite(s): Programming skills with a light background in Perl and HTML. Topics Include: On-line Resources; Server Configuration; Permissions; Setuid Issues; Tainting; Safe Perl; Data Security; OO Programming; Web Modules; CGI Programs; CGI.pm; What Went Wrong?; CGI Template; Using Forms; Form Template; Input Widgets; Submit Widgets; Reset Widgets; Sample Form; Password Fields; Text areas; Hidden Fields; Checkboxes; Radio Boxes; Popup Menus; Lisboxes; Image Maps; Random Links; libwww Modules; Sending Mail; Shopping Carts; Database Access; and Advanced Topics.			
SGI System Administration (Beginning)	**Available on Request (5 days)**		**$1800–$2300***	**7993**
	Prerequisite(s): Familiarity with using Silicon Graphics IRIS workstations and system administration procedures on other open system platforms. Topics Include: The Role of the System Administrator; Set Up and Configuration of an IRIS Workstation or Server; Supporting a Group of Silicon Graphics Users; System Security Maintenance; Backups and Recoveries; Configuration of Disk Drives; System Installation and Application Software; Attaching Terminals and Printers; Modifying the system Start Up and Shut Down Sequences; Automating Administrative Procedures; and Performing Basic System Troubleshooting.			
SGI Network Administration	**9/23–27/96**	**8:30-5:00**	**$1800–$2300***	**11690**
	Prerequisite(s): Completion of Silicon Graphics System Administration (Beginning) course or equivalent knowledge and experience. Topics Include: Networking Fundamentals; Network Configuration; Network Troubleshooting; Resource Management with Network; Information Services; Domain Management with Domain Name System; Electronic Mail with Sendmail; Remote File Sharing with Network File System & Automounter; Network Performance Monitoring; and Network Security.			
SGI System Administration (Advanced)	**10/21–25/96**	**8:30 – 5:00**	**$1800–$2300***	**11689**
	Prerequisite(s): Completion of Silicon Graphics System Administration (Beginning) course or equivalent knowledge and experience. Topics Include: System Error Monitoring; Kernel Reconfiguration and Debugging; System Monitoring Tools; Process Management; MultiProcessor CPU Management; Memory Management and Tuning; Swap Management and Tuning; Disk Management and Tuning; XPS Filesystem Management; and System Security Concepts.			

Course Title	Date	Time	Cost	Course Number
Solaris 2.X System Administration (Beginning)	**9/16–20/96**	**8:30–5:00**	**$1600–$2000***	**7477**

Prerequisite: Knowledge of Unix commands and an editor. Topics include: Custom installation of Solaris2.X server; Add peripheral devices; Use format utility to display partition information; Compress and send binary files; Change system run levels; Add startup files for additional services; Add and remove software packages; Configure terminals and modems; Administer disks and file systems; Discuss basic networking concepts; Configure NFS to support the client-server environment; Use the automounter; Add and remove diskless clients; Back up and restore file systems; Perform basic recovery and troubleshooting procedures; Configure and administer the NIS+ environment.

TCP/IP Internetworking on Windows NT	**Available on Request (4 days)**		**$1600-$1900***	

Prerequisite(s): Completion of Windows NT Workstation and Server class or equivalent knowledge and abilities.Topics Include: Station-to-Station Communications; Connecting the Network; The TCP/IP Protocol Suite; IP Addresses; Subnets; TCP Utilities; System Configuration; SNMP; System Performance; IP Address Resolution; NetBIOS Name Resolution; Host Name Resolution; Implementing WINS; WINS Installation, Configuration, and Management; DHCP in Operation; Implementing DHCP; IP Routing Primer; Windows NT Routing; Heterogeneous Environments; TCP/IP Printing Support; and Installing the FTP Server.

UNIX (Beginning)	**9/30/96–10/4/96**	**8:30 – 12:00**	**$738**	**5267**

Prerequisite(s): Familiarity with a UNIX workstation. Topics Include: Overview of the Workstation Environment; Getting Started; The UNIX File System; Manipulating Files; Customizing Your Environment; The C-Shell; Editing and Writing with vi; Using the Network; Discussing NFS and NIS; Using Basic System Status Commands; Startup and Shutdown Procedures; Using tar.

Windows NT Workstation and Server	**Available on Request (5 days)**		**$1600-$1900***	

Prerequisite(s): This course is valuable for personnel who are evaluating or migrating to Windows NT. It benefits system and network administrators, other support personnel, programmers, and users from Windows, Unix, OS/2, or VMS backgrounds. Topics Include: Introduction to Windows NT; System Overview and Security; Network Configuration Options; Installation; Server Choices; User Administration and Security; Files and Printers; Built-in Network Support; Configuration Options; Using Setup; Data and Disk Management; The Registry; Troubleshooting; and Optimization and Performance.

Research Library Training

The LANL Research Library provides training for using its specialized databases. Training sessions begin and end at times indicated below. Classes are free but you must pre-register by calling the Research Desk at 7-5809 or sending e-mail to library@lanl.gov. Special classes and orientations can also be arranged.

Date	Time	Subject Matter
8/1/96	1:00-1:30 p.m.	SciSearch at LANL—At your desktop!
8/6/96	1:00-1:30 p.m.	Locating Commercial Information for Patents
8/7/96	11:00 -11:30 a.m.	MELVYL (U of CA specialized databases)
8/7/96	1:00-1:30 p.m.	Finding Addresses and Phone Numbers on the WWW
8/8/96	2:00 - 4:00 p.m.	Information Sources on the Internet via WWW
8/13/96	1:00-1:30 p.m.	GeoRef -—Geological Information on CD-ROM
8/15/96	1:00-1:30 p.m.	NTIS (US Govt Sponsored Research)—At your desktop!
8/20/96	1:00-1:30 p.m.	1996 Chemical Abstracts on CD-ROM
8/21/96	1:00-1:30 p.m.	Finding Addresses and Phone Numbers on the WWW
8/22/96	1:00-1:30 p.m.	Business Sources on the WWW
8/22/96	2:00 - 4:00 p.m.	Information Sources on the Internet via WWW
8/27/96	1:00 - 1:30 p.m.	Science Sources on the WWW
8/28/96	1:00 - 1:30 p.m.	Medline on Melvyl
8/29/96	1:00 - 1:30 p.m.	SciFinder—Chemical Abstracts at your desktop!

Lab-Wide Systems Training

The Customer Service Group (CIC-6) offers training for users of Laboratory information systems. The CIC-6 courses offer training for a variety of personnel including property administrators, group secretaries, training coordinators, budget analysts, group leaders, or anyone needing to access training records, property records, costs, employee information, travel, chemical inventories, etc. Refer to the table below and on the following pages for specific information about courses currently offered.

Course Registration
You must have a valid ICN password before taking any of the courses shown in the table. To register for a course, call the CIC-6 Training, Development, and Coordination section at 667-9559 or access our Web page. From the LANL home page, look under "Services/Computing at LANL/Training" or enter the URL:

http://www.lanl.gov:8010/computer-information/cic6/teampage.html

Course Title	Date	Time	Cost	Course Number
Employee Development System - Basic Training (EDS I):	**8/7/96**	**8:30 – 12:00**	**$260**	**Course #5289**
	The course provides hands-on instruction to request course enrollment, use the on-line course catalog, retrieve training transcripts, and assign EDS authorities. The student will learn to create courses, add students to the courses, and generate several training reports.			
Employee Development System - Training Plans (EDS II):	**8/21/96**	**8:30 – 12:00**	**$260**	**Course #7155**
	Participants receive hands-on instruction to create and maintain training plans, assign assignment codes, and generate training plan reports. Attendees must have prior training in the Employee Development System (course #5289).			
Eudora Electronic Mail	**8/5/96**	**1:30 – 3:30**	**$130**	**Course #9762**
	This class is a hands-on class that teaches the participant how to use Eudora software to create, send, receive, and edit electronic mail messages. In addition to these procedures, the participant will learn what related settings mean and how to configure the system to meet his or her individual needs.			
Data Warehouse Basics	**8/19/96**	**1:30 – 3:30**	**$130**	**Course #11961**
	Students will receive hands-on training to generate standard reports and make quick queries from information in the data warehouse, a real-time collection of data tables from Laboratory financial, time-reporting, and personnel systems.			
Data Warehouse/ Financial Reporting	**8/9/96**	**8:30 – 12:00**	**$260**	**Course #11960**
	Students will receive hands-on training to generate standard financial reports and make on-line queries from information in the "data warehouse," a collection of data from Laboratory budgeting, accounting, and time-keeping systems.			

Course Title	Date	Time	Cost	Course Number
Financial Management Information System (FMIS):	**Scheduled on Request**		**$260**	**Course #8338**
	Participants receive hands-on instruction to "explode" and "transfer" through the costs, allocations, and outstanding commitments screens. In addition, participants will create/review reports, access the Information Manager Utility for printing reports, and learn how to assign authorities in the system.			
HTML Basics	**8/20/96**	**8:30 – 12:00**	**$260**	**Course #11605**
	Students will gain a basic understanding of HTML (Hypertext Markup Language), the language for the World Wide Web. Topics covered will be commands and standards, creating and editing documents, and authoring programs.			
HTML Tables	**September**	**8:30 – 12:00**	**$260**	**Course #11959**
	Students gain basic understanding of how to create various tables in HTML and new tags in HTML 3.0. Netscape-specific tags are also identified for clarity. Prerequisite: HTML Basics (Course #11605) or permission of the instructor.			
Introduction to the Internet: Beginning Netscape	**September**	**1:30 – 3:30**	**$130**	**Course #10961**
	Students gain basic understanding of the Internet and the World Wide Web and the use of Netscape as a browser to surf the Net. Topics covered are both Laboratory sites and open sites, along with practical uses of the Internet.			
Lotus Notes 4.0	**8/19/96**	**1:30 – 5:00**	**$260**	**Course #9917**
	This class provides hands-on instruction for Mac and PC users to use Lotus Notes software to create and send E-mail memos; fax documents; search databases; create filters, nicknames, banners, and doclinks; set defaults; and use multiple address books. In addition, participants learn how to use the memo, meetings, and discussion databases.			
On-Line Forms	**September**	**3:30 – 5:00**	**$130**	**Course #9756**
	Participants will learn to use Netscape software to access Lab-wide information and forms. Using Jetform Filler software, participants will access, complete, and print forms such as the "ICN Validation Request," "Visitor Request for Unclassified Visits to Security Areas," and "Request for Quotation."			
PCS Overview	**Scheduled on Request**		**no charge**	**Course #11924**
	Overview of Purchase Card System. Students will have taken BUS-5's credit card course. Call Ruby O'Rear at 665-4523 for course schedules.			

Course Title	Date	Time	Cost	Course Number
Property Accounting, Inventory, and Reporting System (Advanced)	**Scheduled on request**		**$260**	**Course #9918**
	This course will include a refresher of PAIRS, advanced techniques and tips, explanation of the notification system, and report capabilities. Swap Shop, Loan Out information, and support tables will be discussed. Participants should already have a basic understanding of and know how to use PAIRS.			
Purchase Card System	**8/8/96**	**1:30 – 2:30**	**no charge**	**Course #11924**
	Prerequisite: PCS Overview. Students will learn to reconcile monthly statement of account, submit reconciled statement of account for approval, print statement of account for audit records, and delegate reconciliation authority.			
Reporting with Infomaker	**8/15–16/96**	**8:30 – 5:00**	**$560**	**Course #11054**
	Hands-on training to query data and develop ad hoc, or non-standard, reports from the LANL data warehouse using Infomaker software.			
Time and Effort System (GUI)	**8/22/96**	**8:30 – 10:00**	**no charge**	**Course #11018**
	The student will learn how to enter attendance, amend attendance, approve attendance, and submit exception and approval reports. Time codes and associated policies will also be discussed. In addition, the student will learn how to use the Information Manager utility to view and print reports.			
Travel—New!	**Several Dates**	**8:30 – 11:30**	**no charge**	**Course #12091**
	Hands-on training to submit and approve travel requests and expenses in the new Travel System which replaces the TRIPS on-line system and the post-travel expense worksheets.			

CUT ALONG DASHED LINE

Los Alamos
National Laboratory

INTEGRATED COMPUTING NETWORK (ICN) VALIDATION REQUEST

To access ICN computing resources, please complete all parts of this form that apply to you, including "Special Requirements."

If you have **questions**: Call: (505) 665-1805
E-mail: validate@lani.gov

Mail your completed application to:
ICN Password Office (PWO)
Mail Stop: B271
Los Alamos National Laboratory
Los Alamos, NM 87545

All Laboratory computers, computing systems, and their associated communication systems are for official business only. By completing this request, users agree not to misuse the ICN. The Laboratory has the responsibility and authority to perodically audit user files.

Owner Information

Z-Number (if you have one)	PWO Use Only	Name (last, first, middle initial)
LANL Group	LANL Mail Stop	Citizenship (Foreign National see "Special Requirements-Foreign National")
Phone Number	Cost Center	Program Code

Check LANL affiliation:

- ☐ LANL employee
- ☐ Contractor _____ (specify contract company)
- ☐ Consultant, VSM, associate
- ☐ External user_____ (specify employer)
- ☐ Other (specify)_____

Send password / smartcard to:

☐ Mail Stop or ☐ Mail to address indicated below

Name / Organization
Address
City, State, Zip Code

Access Check access method and needed partitions:

Access method: ☐ ICN Password ☐ Smartcard ☐ Both

☐ **Open** partition (e.g., email systems, open machines)

☐ **Administrative** partition (e.g., IA [BUCS, Stores, Travel], IB [EIS, FMIS, PAIRS])
If you are not a Q-cleared LANL employee, see required steps in section "Special Requirements-Administrative Partition," unless you already have Administrative access with an ICN password.

☐ **Secure** partition (i.e., secure machines)
Indicate level(s) of data to be processed:
- ☐ Unclassified
- ☐ Secret

I certify this person does require secure access:

_____ _____
Manager Signature (Group Leader or above) Date

NOTE: A Q-clearance is required. All classified computing must be performed within the Secure environment.

PWO Use Only

New ☐ Change ☐	Clearance Status	Processed	Lv	Smartcard Serial #
Comments:				

Form 1646 (1/95) Supersedes previous versions (rev. 10/20).

Continue

Special Requirements

Administrative Partition

(U.S. Citizens Only) Lab-Wide Systems (e.g., IA [BUCS, Stores, Travel], IB [EIS, FMIS, PAIRS])

☐ Under 18 years of age

If you need to access Administrative systems, your group leader must provide a memo accepting responsibility for your actions and justifying your need for access. This memo is to accompany all forms taken to the security briefing (see "Contractor or Non-Q-Cleared") section below. You may not access the Secure Partition.

☐ Contractor or Non-Cleared

Phone (505) 667-9444 to obtain Access Authorization packet.

Phone (505) 667-9153 to schedule a security briefing.

Bring all forms including this ICN Validation Request to the security briefing for approval.

Security Briefing Approval Signature	Date

☐ Foreign National

Attach a copy of Form 982 (REQUEST FOR UNCLASSIFIED VISIT OR ASSIGNMENT BY A FOREIGN NATIONAL) with all approval signatures. Be sure Box #11 of Form 982 is completed. If you are not a visitor/assignee under a LANL/DOE approved Visit / Assignment Request, attach written justification from your host Division Director describing your need to access the ICN.

Authorization (required)

Print Manager Name (Group Leader or above)	Manager Z-Number	Group
Manager Signature (Group Leader or above)	**Mail Stop**	**Date**

If you are NOT a LANL employee, obtain your LANL contact's signature in addition to the contact's manager's signature.

NOTE: LANL contacts are regular Laboratory employees. Contacts are responsible for obtaining annual re-authorizations, forwarding renewals, and notifying the ICN Password Office of changes in user or contact status.

Print LANL Contact Name	Contact Z-Number	Phone Number	Group
LANL Contact Signature		**Mail Stop**	**Date**

Reader Feedback

Feedback helps us to provide a document that responds to the changing needs of its readership. If you have comments or questions about this publication, please let us hear from you. We have reserved the back of this form for that purpose. We also accept articles for publication that are of interest to our readers. Contact the managing editor for more information. This form is also used for new subscriptions, deletions, or changes. Instructions are on the back. If you prefer to contact us by E-mail, send your comments and/or subscription request to finney@lanl.gov.

Do Not Staple
Fold on This Line First

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST-CLASS MAIL PERMIT NO. 88 LOS ALAMOS NM

POSTAGE WILL BE PAID BY THE ADDRESSEE

MAIL STOP B251
ATTN: MIKE FINNEY, MANAGING EDITOR
CUSTOMER SERVICE GROUP (CIC-6)
LOS ALAMOS NATIONAL LABORATORY
PO BOX 1663
LOS ALAMOS NM 87544-9916

Do Not Staple, Seal with Tape
Fold Here

cut along dashed line

Feedback

New Subscriptions, Deletions, and Changes

BITS is published by Los Alamos National Laboratory. If you would like to be added to or deleted from our mailing list, please check the appropriate line, complete the form below, and mail us the form.

_____ Add my name to the **BITS** mailing list.

_____ Delete my name from the **BITS** mailing list.

_____ Change my name/address as indicated below.

Name		Date
Address		Mail Stop
Group	Organization	
City	State	Zip
Phone	Number of copies	Employee Z#

INDEX

Produced by the Computing, Information, and Communications (CIC) Division
Managing Editor: Mike Finney (667-2241 or finney@lanl.gov)
Design: Gloria Sharp and Mike Finney
Illustration: Dave Delano
Printing: Media Group (CIC-17)

Los Alamos
NATIONAL LABORATORY

Los Alamos
NATIONAL LABORATORY

Los Alamos, New Mexico 87545

BITS is published monthly to highlight recent computing and communications activities within the Laboratory. We welcome your suggestions and contributions. BITS can be accessed electronically via Web browsers such as Mosaic and Netscape. Enter the following URL:

http://www.lanl.gov/Internal/divisions/cic/publications.html

LALP-96-11 (7-96)